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HEADQUARTERS
UNITED STATES CONTINENTAL ARMY COMMAND
FORT MONROE, VIRGINIA

ATD-V-6

23 July 1962

SUBJECT: Report of Test, Project No. 4762, "Evaluation of a Double-Wall, Tubular-Cell, Air-Supported Type of Tent"


TO: Chief of Research and Development
Department of the Army
Washington 25, D. C.

1. Attached herewith is US Army Aviation Board Report of Test, subject as shown above.

2. This headquarters concurs in the conclusion and recommendation contained in subject report. The recommendation is restated as follows: "That a prototype double-wall, tubular-cell, air-supported tent with end curtains, generally conforming to that described in paragraph 5, be constructed and provided to the US Army Aviation Board for service test.

FOR THE COMMANDER:

1 Incl
Report of Test,
Project No. 4762,
USRAVNBD, 29 Jun 62


LEE L. STEWART
Colonel, AGC
Asst Adjutant General

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a), the smaller of the two, would be suitable after minor modification for use with the L-19, L-20 and H-13 aircraft, and could be used with the Light Observation Helicopter (LOH) with further minor modification. The T60-1 tent was found to be unsuitable primarily because it was not large enough to accommodate the HU-1() helicopter (reference b), and it was considered that modification to permit accommodation of the HU-1() would substantially penalize both weight and erection characteristics.

c. As a result, it was recommended in reference b, and concurred in by the Commanding General, USCONARC, in reference c, that a double-wall, tubular-cell, air-supported tent should be evaluated to determine the feasibility of utilizing that type of tent to provide shelter for the HU-1() helicopter and those aircraft having a requirement for a shelter of similar size.

3. DESCRIPTION OF MATERIEL.

a. The test item consists essentially of neoprene-coated dacron fabric. The walls and roof are formed in an arch configuration and consist of two layers of material sealed together at the edges. Transverse tubular cells are formed by the addition of inner walls dividing the air space between the layers into cells of approximately 12 inches in cross-section. All cells vent into common manifold areas running horizontally from front to rear of the tent at ground level at each side. The manifold area on one side contains a short metal tube and flapper valve to allow introduction of inflating air under pressure and its retention when the air source is withdrawn. This manifold area also contains an air-tight slide fastener of approximately three feet in length to allow quick tent deflation.

b. A single-layer back curtain with two personnel doors is sewed into the tent. A removable front curtain, containing a vertical-lift slide-fastening door approximately 12 feet long by 10 feet high, is attached to the tent by hooks and grommets.

c. Guying of the tent is accomplished by the use of dacron ropes, four of which were provided with the tent. These ropes attach

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to the tent at "D" rings which are secured by gussets to the outer tent sides approximately two-thirds up its height.

d. A centrifugal blower unit, comprised of an electric motor using 110 volts a. c. at 7 amperes or 220 volts a. c. at 3.5 amperes and a centrifugal blower capable of 3/4 pounds air pressure at 40 cubic feet per minute, was provided for inflation. An electric power source was not provided.

4. TESTS. The tent was erected and struck a total of 16 times during the test period.

a. Physical Characteristics.

(1) The inside of the tent, when inflated, measured approximately 12 feet long, 20 feet wide and 13 feet high. The tent, when disassembled and packed for transport, occupied a volume of approximately 32 cubic feet and weighed 335 pounds. The tent blower occupied a volume of approximately two cubic feet and weighed 82 pounds.

(2) After inflation, the tent when free of leaks remained erect for periods of approximately 50 minutes after which additional pressure was required. (Leaks encountered, which were subsequently repaired, reduced this time to 15 minutes.)

(3) The test item, when delivered to this Board for evaluation, had already experienced two years of testing to include environmental testing at Fort Churchill, Canada. Despite this previous usage, the ruggedness of material and construction was evident in that only four failures of the tent (leaks) occurred during the test period. Of these, two were simple punctures of the fabric, the third was at the quick-deflation slide fastener, and the fourth was at the inflation flapper valve. One actual and two incipient failures of a guy rope attaching point were also observed. See paragraph 4b(4).

(4) The electric power requirement for inflation of the tent could be met by generating equipment now authorized in aviation unit TOE's.

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b. General Characteristics.

(1) Provisions for lighting, both natural and artificial, were inadequate. Roll-up windows equipped with blackout flaps in the end curtains and an electric lighting harness assembly should provide adequate lighting.

(2) Ventilation of the tent would be considered adequate with the addition of roll-up windows for temperate climates except under blackout conditions.

(3) In most respects blackout provisions were superior to those available in frame-type tents. This was attributable to the J-hook and grommet style attachment of the removable end curtain. Blackout flaps, however, were not provided for the personnel doors.

(4) During the test period, winds up to approximately 30 knots were encountered. Provisions for guying the tent were considered inadequate inasmuch as the "D" rings on the outer tent side walls tended to tear out under wind loads encountered. One failure and two incipient failures of the reinforcing fabric holding the "D" rings to the tent wall were observed. Ground anchors for securing the guys were required, but not provided.

(5) The test item could be erected, struck, and packed by two men. Handling of the packed tent required four men due to its weight. Average inflation time was eight minutes. Deflation time was approximately two to three minutes. Packing or unpacking the tent required approximately 15 minutes. The tent was found to be movable by four men when erected.

(6) Simple puncture leaks of the tent structure were easily repaired by one man, using the repair materials provided. The tent was reusable two hours after patch application although a 24-hour curing period for the patch cement was recommended. Leaks at the quick deflation slide fastener and the inflation flapper valve could not be repaired locally, but the leaks were sealed off with field expedients, i. e. masking tape and sheet rubber with metal clamps.

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5. DISCUSSION. The test results reported above were analyzed to arrive at the following criteria for a double-wall, tubular-cell tent for an HU-1() helicopter:

a. By elevating the test item on a sling, the dimensional requirements necessary for the HU-1() helicopter have been determined to be:

<u>Minimum Height at Apex</u>	<u>Minimum Length (Between End Curtains)</u>	<u>Minimum Width</u>
16 feet 4 inches	16 feet	24 feet

As the practical tent length precludes total coverage of the helicopter, end curtains tailored to fit around the helicopter aft of the pilot's door and aft of the engine exhaust tail pipe are required.

b. The construction of a tent of this type to the dimensions described above as a single unit implies a tent weight of approximately 800 pounds. To reduce the difficulties in man-handling such a heavy mass, sectionalization of the tent main structure to two nine-foot lengths is required.

c. The tent dimensions considered suitable for the HU-1() helicopter appear, upon examination, to be adequate to provide shelter for organizational maintenance on the major maintenance areas of the following aircraft: U-1A, AO-1, L-23, AC-1, H-23, H-19, H-21, H-34, and H-37 (engine nacelle). Further requirements to provide shelter for these aircraft with this tent include only provision of suitable end curtains which will permit adequate blackout.

d. It appears that this type of tent can be designed to incorporate those features outlined in paragraphs 7 (excluding 7f) through 14 of the MC's (reference e).

6. CONCLUSION. Provision of adequate shelter for the performance of organizational maintenance upon the HU-1() helicopter and some other Army aircraft appears feasible through use of a double-wall, tubular-cell, air-supported tent of suitable dimensions.

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7. RECOMMENDATION. It is recommended that a prototype double-wall, tubular-cell, air-supported tent with end curtains, generally conforming to that described in paragraph 5, be constructed and provided to this Board for service test.

8. REFERENCES.

a. Report of Test, Project No. AVN 861, "Service Test of Tent, Aviation Maintenance, Small, Adjustable, for Fixed-Wing Aircraft, T59-1," US Army Aviation Board, 28 March 1962.

b. Report of Test, Project No. AVN 961, "Service Test of Tent, Aviation Maintenance, Small, Adjustable, Nose-In, T60-1," US Army Aviation Board, 30 March 1962.

c. Message, CG, USCONARC, ATDEV-6 707309, subject: "Maintenance Shelters for Army Aircraft," dated 30 April 1962.

d. Paragraph 1639b(18), Combat Development Objectives Guide.

e. Disposition Form, CRD/D 2973, Chief, Research and Development, 4 March 1958, subject: "USCONARC-Approved Military Characteristics for Army Aircraft Maintenance Shelters," with two inclosures.

 LTCBL
FOR JACK L. MARINELLI
Colonel, Artillery
President